which can come as near to g as we wish . . .," p. 136, while the character of the region of definition is treated as wholly arbitrary.

ALBERT A. BENNETT.

Jahrbuch über die Fortschritte der Mathematik . . . herausgegeben. Von E. LAMPE† und A. KORN. Band 45. Jahrgang 1914-1915. (In 3 Heften) Heft 1. Berlin und Leipzig, Vereinigung Wissenschalflicher Verleger, 1919, 12+368 pp.

The Heft opens with a fine portrait and a seven page appreciation of Emil Lampe's life and work. He was an editor of the "*Fortschritte*" since Jahrgang 1883. The Heft covers History and philosophy, Algebra, Arithmetic, and about twenty five pages of the fourth section on Combinatory analysis and the calculus of probabilities. The number of pages for the first three sections is about eighty more than for the corresponding sections of Jahrgang 1913, and about sixty more than for a similar portion of Jahrgang 1912.

The Theory of the Imaginary in Geometry together with the Trigonometry of the Imaginary. By J. L. S. HATTON, Cambridge, at the University Press, 1920. Royal 8vo. 8 + 216 pp. Price 18 shillings.

Preface: "The position of any real point in space may be determined by means of three real coördinates, and any three real quantities may be regarded as determining the position of such a point. In geometry as in other branches of pure mathematics the question naturally arises, whether the quantities concerned need necessarily be real. What, it may be asked, is the nature of the geometry in which the coördinates of any point may be complex quantities of the form $x + ix'$, $y + iy'$, $z + iz'$? Such a geometry contains as a particular case the Geometry of real points. From it the geometry of real points may be deduced (a) by regarding x', y', z' as zero, (b) by regarding x, y, z as zero, or (c) by considering only those points, the coördinates of which are real multiples of the same complex quantity $a + ib$. The relationship of the more generalized conception of geometry and of space to the particular case of real geometry is of importance, as points, whose determining elements are complex quantities, arise both in coördinate and in projective geometry.

"In this book an attempt has been made to work out and determine this relationship. Either of two methods might have been adopted. It would have been possible to lay down certain axioms and premises and to have developed a general theory therefrom. This has been done by other authors. The alternative method, which has been employed here, is to add to the axioms of real geometry certain additional assumptions. From these, by means of the methods and principles of real Geometry, an extension of the existing ideas and conceptions of geometry can be obtained. In this way the reader is able to approach the simpler and more concrete theorems in the first instance, and step by step the well-known theorems are extended and generalized. A conception of the imaginary is thus gradually built up and the relationship between the imaginary and the real is exemplified and developed. The theory as here set forth may be regarded from the analytical point of view as an exposition of the oft quoted but seldom explained 'Principle of Continuity.'

"The fundamental definition of Imaginary points is that given by Dr. Karl v. Staudt in his *Beiträge zur Geometrie der Lage;* Nuremberg, 1856 and 1860. The idea of (α, β) figures, independently evolved by the author, is due to J. V. Poncelet, who published it in his *Traité des Propriétés Projectives des Figures* in 1822. The matter contained in four or five pages of Chapter II is taken from the lectures delivered by the late Professor Esson, F.R.S., Savilian professor of geometry in the University of Oxford, and may be partly traced to the writings of v. Staudt. For the remainder of the book the author must take the responsibility. Inaccuracies and inconsistencies may have crept in, but long experience has taught him that these will be found to be due to his own deficiencies and not to fundamental defects in the theory. Those who approach